EXHIBIT A

putted from the optical transmitters 11_1 to 11_N are combined by the optical multiplexer 12, travel over the optical fiber transmission line 20, and arrive at the optical demultiplexer 32. The combined component signals are separated by the optical demultiplexer 32 according to their wavelengths. The component signal having a wavelength of λ_n is received by the optical receiver 31_n. The suffix "n" indicates n-th in order of an individual component signal, optical transmitter, or optical receiver in the total number N.

In the optical transmission system 1, when the component signal having a wavelength of λ_n travels from the optical transmitter 11_n to the optical receiver 31_n, it suffers a loss of α_n (dB), which is expressed by formula (1).

$$\alpha_n = \alpha_{1,n} + \alpha_{2,n} + \alpha_{3,n} \qquad ...(1),$$

where

$\alpha_{1,n}$: insertion loss (dB) of the optical multiplexer 12

$\alpha_{2,n}$: total transmission loss (dB) in the optical fiber transmission line 20

$\alpha_{3,n}$: insertion loss (dB) of the optical demultiplexer 32.

When a component signal having a wavelength of λ_n is outputted from the optical transmitter 11_n and it has a fixed power of P_0 (dBm) without regard to its wavelength, the component signal arriving at the optical receiver 31_n has a power of P_n (dBm), which is expressed by formula (2).

$$P_n = P_0 - \alpha_n \qquad ...(2).$$

In the optical transmission system 1, the optical fiber transmission line 20 has a length of at most 150 km, which is the maximum transmission length of an practical optical transmission system without an optical fiber amplifier, and